Colorimetric detection of urine glucose based ZnFe$_2$O$_4$ magnetic nanoparticles

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Figure S1. XRD patterns of ZnFe$_2$O$_4$ MNPs before (a) and after (b) the catalytic reaction.
Figure S2. TEM image of ZnFe$_2$O$_4$ MNPs.
Figure S3. Magnetization curve of ZnFe$_2$O$_4$ MNPs. Inset: image of solution after and before magnetic separation of ZnFe$_2$O$_4$ MNPs.
Figure S4. The values of zeta potential of ZnFe$_2$O$_4$ MNPs at different pH. The error bars represent the standard deviation of three measurements.
Figure S5. ZnFe$_2$O$_4$ MNPs peroxidase-like activity is dependent on a) pH, b) temperature and c) H$_2$O$_2$ concentration; Experiments were carried out using 10 µL of 5.0 mg mL$^{-1}$ ZnFe$_2$O$_4$ MNPs in 235 µL HAc-NaAc buffer (0.2 M, pH 4.0) with 27 µL of 5 mM TMB or 27 µL of 0.1 M H$_2$O$_2$ as substrate at pH 4.0 and 40 °C for 10 min unless otherwise stated. 200 µL of the resulting solution without ZnFe$_2$O$_4$ MNPs was added into 2.8 mL of 0.3 M sulfuric acid and the reaction was stopped. Then the absorbance was read at the maximum absorbance of 450 nm. The maximum point in each curve was set as 1.0. The error bars represent the standard deviation of three measurements.
Figure S6 UV-vis spectra and typical photograph of the complex compound of Fe$^{2+}$ and 1,10-phenanthroline (From left to right: pH 2.0, 3.0, 3.5, 4.0, 4.5, 5.0).
Figure S7. Steady-state kinetic assay and catalytic mechanism of ZnFe$_2$O$_4$ MNPs (a–d). The velocity (v) of the reaction was measured using 40 µg mL$^{-1}$ ZnFe$_2$O$_4$ MNPs in 3.0 mL of 0.2 M HAc-NaAc buffer at pH 4.0 and 40 °C. The error bars represent the standard error derived from three repeated measurements. (a) The concentration of H$_2$O$_2$ was 0.2 mM and TMB concentration was varied. (b) The concentration of TMB was 320 µM and H$_2$O$_2$ concentration was varied. (c, d) Double reciprocal plots of activity of ZnFe$_2$O$_4$ MNPs with the concentration of one substrate (TMB or H$_2$O$_2$) fixed and the other varied. Details are included in the Experimental Section.
Figure S8. Relative catalytic activity of ZnFe$_2$O$_4$ MNPs after incubation at a range of pH values (2-11) (a), and a range of temperatures (0-90 °C) for 2 h (b). The error bars represent the standard deviation of three measurements.